

IN THE CLAIMS

Please change the following claims to read as follows:

1. (Amended) A spin valve device comprising:

2 a gap layer,

3 a single buffer layer having a top surface and which is composed of a layer of a single refractory
4 material formed on the top surface of the gap layer,

5 patterned underlayers formed directly over the buffer layer including layers selected from the
6 group consisting of a first group consisting of a lower antiferromagnetic layer stacked with a
7 ferromagnetic layer and a second group consisting of a chromium layer stacked with a permanent
8 magnetic layer plus an optional conductor layer,

9 an inwardly tapered depression formed extending through the patterned underlayers down to the
10 surface of the buffer layer,

11 a stack of layers formed covering the patterned underlayers and reaching down to cover the
12 inwardly tapered depression including:

13 a free layer [(FL)],

14 a spacer layer [(CU)],

15 a pinned layer [(PH)],

16 an upper antiferromagnetic layer [(AFM2)], and

17 conductors formed either on the surface of the upper antiferromagnetic layer aside from the
18 depression or between the buffer layer and the patterned underlayers,

19 [a] whereby the patterned [underlayer] underlayers which are located aside from the inwardly
20 tapered depression [that includes a magnetic material (TFM, PM) for providing] provide trackwidth and
21 longitudinal bias.

1 2. (Amended) [A spin valve] The device of [in accordance with] claim 1 wherein [said magnetic

2 material in said] the underlayers include[s] an antiferromagnetic material selected from the group

3 consisting of IrMn, RhMn, RuMn, RuRhMn, FeMn, FeMnRh, FeMnCr, CrPtMn, TbCo, NiMn, PtMn,

4 PtPdMn, NiO, CoO, and CoNiO.

Claim 3 has been cancelled.

Division of Serial No. 10/104,778 filed 22 March 2002

1 4. (Amended) [A spin valve] The device of [in accordance with] claim 1 [3] wherein [said] the buffer
2 layer consists of a material selected from the group consisting of Nb, Ta, Ti, Zr, Hf, Mo, W.

1 5. (Amended) [A spin valve] The device of [in accordance with] claim 1 [3] wherein the
2 ferromagnetic layer in the first group consists of at least one material selected from the group
3 consisting of Co, CoFe, Ni, and NiFe.

1 6. (Amended) [A spin valve] The device of [in accordance with] claim 1 wherein a conductor is
2 provided consisting of a material selected from the group consisting of Au, Ag, W, Mo, Rh, Ru, Ti, β -
3 Ta, TiW, TaW, and $\text{Cu}_{50}\text{Au}_{50}$.

Add the following claims, previously added to the parent application.

1 45. A spin valve device comprising:

2 a gap layer,
3 a buffer layer having a top surface and comprising a single layer of a refractory material formed
4 on the top surface of the gap layer,
5 patterned underlayers formed on the buffer layer including:
6 a) a lower antiferromagnetic layer formed on the buffer layer,
7 b) a thin ferromagnetic layer formed on the lower antiferromagnetic layer,
8 an inwardly tapered depression in the patterned underlayers down to the surface of the buffer
9 layer,
10 a stack of layers formed covering the patterned underlayers and reaching down to cover the
11 inwardly tapered depression including:
12 c) a free layer,
13 d) a spacer layer,
14 e) a pinned layer,
15 f) an upper antiferromagnetic layer,
16 whereby the patterned underlayers, which are located aside from the inwardly tapered
17 depression, provide trackwidth and longitudinal bias.

Division of Serial No. 10/104,778 filed 22 March 2002

1 46. The device of claim 45 wherein the lower antiferromagnetic material is selected from the group
2 consisting of IrMn, RhMn, RuMn, RuRhMn, FeMn, FeMnRh, FeMnCr, CrPtMn, TbCo, NiMn, PtMn,
3 PtPdMn, NiO, CoO, and CoNiO.

1 47. The device of claim 45 wherein the buffer layer consists of a material selected from the group
2 consisting of Nb, Ta, Ti, Zr, Hf, Mo, W.

1 48. The device of claim 45 wherein the ferromagnetic layer consists of at least one material selected
2 from the group consisting of Co, CoFe, Ni, and NiFe.

1 49. The device of claim 45 wherein a conductor is provided consisting of a material selected from the
2 group consisting of Au, Ag, W, Mo, Rh, Ru, Ti, β - Ta, TiW, TaW, and Cu₅₀Au₅₀.

1 50. The device of claim 45 wherein a conductor layer with reduced electrical lead resistance was
2 added and aligned after spin valve deposition.

Division of Serial No. 10/104,778 filed 22 March 2002

1 51. A spin valve device comprising:

2 a gap layer,

3 a buffer layer having a top surface and which is composed of a refractory material formed over
4 the gap layer,

5 patterned underlayers formed on the buffer layer including:

6 a) a thin ferromagnetic layer formed on the buffer layer,

7 b) a lower antiferromagnetic layer formed on the thin ferromagnetic layer,

8 an inwardly tapered depression in the patterned underlayers down to the surface of the buffer
9 layer,

10 a stack of layers formed covering the patterned underlayers and reaching down to cover the

11 inwardly tapered depression including:

12 c) a free layer,

13 d) a spacer layer,

14 e) a pinned layer,

15 f) an upper antiferromagnetic layer,

16 whereby the patterned underlayers, which are located aside from the inwardly tapered
17 depression, provide trackwidth and longitudinal bias.

1 52. The device of claim 51 wherein the lower antiferromagnetic material is selected from the group
2 consisting of IrMn, RhMn, RuMn, RuRhMn, FeMn, FeMnRh, FeMnCr, CrPtMn, TbCo, NiMn, PtMn,
3 PtPdMn, NiO, CoO, and CoNiO.

1 53. The device of claim 51 wherein the buffer layer consists of a material selected from the group
2 consisting of Nb, Ta, Ti, Zr, Hf, Mo, W.

1 54. The device of claim 51 wherein the ferromagnetic layer consists of at least one material selected
2 from the group consisting of Co, CoFe, Ni, and NiFe.

1 55. The device of claim 51 wherein a conductor is provided consisting of a material selected from the
2 group consisting of Au, Ag, W, Mo, Rh, Ru, Ti, β - Ta, TiW, TaW, and Cu₅₀Au₅₀.

56. The device of claim 51 wherein a conductor layer with reduced electrical lead resistance was added and aligned after spin valve deposition.

57. A spin valve device comprising:

a gap layer,
a single buffer layer having a top surface and which is composed of a layer of a single refractory material formed on the top surface of the gap layer,
patterned underlayers formed directly over the buffer layer consisting of a stack of a conductor layer covered by a lower antiferromagnetic layer covered by a ferromagnetic layer,
an inwardly tapered depression formed extending through the patterned underlayers down to the surface of the buffer layer,
a stack of layers formed covering the patterned underlayers and reaching down to cover the inwardly tapered depression including:
a free layer,
a spacer layer,
a pinned layer,
an upper antiferromagnetic layer, and
conductors formed either on the surface of the upper antiferromagnetic layer aside from the depression or between the buffer layer and the patterned underlayers,
whereby the patterned underlayers which are located aside from the inwardly tapered depression provide trackwidth and longitudinal bias.

1 58. A spin valve device comprising:
2 a gap layer,
3 a single buffer layer having a top surface and which is composed of a layer of a single refractory
4 material formed on the top surface of the gap layer,
5 patterned underlayers formed directly over the buffer layer consisting of a stack of a conductor
6 layer, covered by a chromium layer covered in turn by a permanent magnetic layer,
7 an inwardly tapered depression formed extending through the patterned underlayers down to the
8 surface of the buffer layer,
9 a stack of layers formed covering the patterned underlayers and reaching down to cover the
10 inwardly tapered depression including:
11 a free layer,
12 a spacer layer,
13 a pinned layer,
14 an upper antiferromagnetic layer, and
15 conductors formed either on the surface of the upper antiferromagnetic layer aside from the
16 depression or between the buffer layer and the patterned underlayers,
17 whereby the patterned underlayers which are located aside from the inwardly tapered depression
18 provide trackwidth and longitudinal bias.

1 59. A spin valve device comprising:
2 a gap layer,
3 a single buffer layer having a top surface and which is composed of a layer of a single refractory
4 material formed on the top surface of the gap layer,
5 patterned underlayers formed directly over the buffer layer consisting of a stack of a conductor
6 layer covered by a lower antiferromagnetic layer covered by a ferromagnetic layer,
7 an inwardly tapered depression formed extending through the patterned underlayers down to the
8 surface of the buffer layer which has a recessed upper surface at the bottom of the depression,
9 a stack of layers formed covering the patterned underlayers and reaching down to cover the
10 inwardly tapered depression including:
11 a free layer,
12 a spacer layer,
13 a pinned layer,
14 an upper antiferromagnetic layer, and
15 conductors formed either on the surface of the upper antiferromagnetic layer aside from the
16 depression or between the buffer layer and the patterned underlayers,
17 whereby the patterned underlayers which are located aside from the inwardly tapered depression
18 provide trackwidth and longitudinal bias.

1 60. A spin valve device comprising:
2 a gap layer,
3 a single buffer layer having a top surface and which is composed of a layer of a single refractory
4 material formed on the top surface of the gap layer,
5 patterned underlayers formed directly over the buffer layer consisting of stacked of a conductor
6 layer covered by a chromium layer covered by a permanent magnetic layer,
7 an inwardly tapered depression formed extending through the patterned underlayers down to the
8 surface of the buffer layer which has a recessed upper surface at the bottom of the depression,
9 a stack of layers formed covering the patterned underlayers and reaching down to cover the
10 inwardly tapered depression including:
11 a free layer,
12 a spacer layer,
13 a pinned layer,
14 an upper antiferromagnetic layer, and
15 conductors formed either on the surface of the upper antiferromagnetic layer aside from the
16 depression or between the buffer layer and the patterned underlayers,
17 whereby the patterned underlayers which are located aside from the inwardly tapered depression
18 provide trackwidth and longitudinal bias.

1 61. A spin valve device comprising:
2 a gap layer,
3 a single buffer layer having a top surface and which is composed of a layer of a single refractory
4 material formed on the top surface of the gap layer,
5 patterned underlayers formed directly over the buffer layer consisting of stack of a conductor
6 layer covered by chromium layer covered by a permanent magnetic layer,
7 an inwardly tapered depression formed extending through the patterned underlayers down to the
8 surface of the buffer layer which has a recessed upper surface at the bottom of the depression,
9 a stack of layers formed covering the patterned underlayers and reaching down to cover the
10 inwardly tapered depression including:
11 a free layer,
12 a spacer layer,
13 a pinned layer,
14 an upper antiferromagnetic layer, and
15 conductors formed either on the surface of the upper antiferromagnetic layer aside from the
16 depression or between the buffer layer and the patterned underlayers,
17 whereby the patterned underlayers which are located aside from the inwardly tapered depression
18 provide trackwidth and longitudinal bias.